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APPENDIX II.

[Vide answer to question No. 1731 asked by the Raja of Ramnad at the meeting of the Legislative Council held on the 14th March 1928, page 88 supra.]

1

Letter R.O.C. No. 272-*G of* 1925, *dated* 26*th July* 1927, *from the President, District Board, Madura.*

[Madura District Board Office Buildings.]

I have the honour to submit herewith a copy of letter received from the District Board Engineer in the matter.

Copy of communication, R.O.C. No. 299-*D of* 1927, *dated* 15*th July* 1927, *from the District Board Engineer, Madura, to the President, District Board, Madura.*

The foundation work for the new District Board office building at Madura was started in April 1926. The building is about 200 feet by 52 feet. At the time of construction, it was considered necessary to shift the site of the building about 40 feet to the east. In the western portion, kankar soil was met with at a depth of 8 to 9 feet below ground level and in the eastern portion, compact sand was met with at a depth of 10 feet and kankar at a depth of 13 to 14 feet. Consequently, sand filling in the foundation had to be done for varying depths up to the level of bottom of concrete. The sand filling was done properly in layers of 1 foot, well watered and consolidated. The work was finished up to the top level of basement by the end of September 1926. On the 30th and 31st October 1926, there was very heavy rainfall of 8 inches in less than 48 hours. Two or three days after the rains, six cracks appeared in the masonry—five in the cross walls and one in the northern veranda retaining wall. The main walls all round and the other portions are quite intact.

The work was executed as carefully as possible, the materials used being all of good quality. The lime for the work was manufactured at the spot under proper supervision.

The cracks have been since minutely examined by opening the sub-soil up to the bottom of concrete. It was found that, only in two places fine hair cracks extend to the bottom of concrete. In the remaining four places, the cracks exist only in the masonry and extend only up to the top of concrete. Since November last, there has been no further development in the cracks.

The Chief Engineer and the Superintending Engineer have both inspected the building after the cracks appeared. As per orders of the Superintending Engineer some tests were conducted about the middle of the last month to find out if the settlement of the foundation was complete. Cement tell-tale pats were put on the lines of the cracks at vertical intervals of 1 foot and the whole of the sand filling was flooded with water equivalent to 8 inches of rainfall in 24 hours with the aid of a 4 inches centrifugal pump. Levels were taken at about 60 points on the top of basement, both before the flooding and also six days after the flooding. During this interval, there was also a heavy rainfall of 4 inches in 2 hours. The levels indicate that there has been no settlement whatever of the foundation as a result of the flooding nor was there any development in the cracks.

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The cracks are not due to any defect in the work. The position and the nature of the cracks in the five cross walls show, that the principal cause is due to the unbalanced hydraulic pressure of the water which fell within the walls during the heavy rains tending to push outwards the exterior walls which has caused cracks in the weakest portion in the masonry, the mortar in the interior not having properly set.

As the foundations for the eastern and western portions vary on account of the depth of the kankar soil below, the only precaution that has now to be undertaken is to make suitable arrangements for distributing the load uniformly over the entire area. The results of the tests arrived at have been reported to the Superintending Engineer and proposals submitted for rectifying the local defects in the cracked portions and for laying a ferro-concrete slab just below the floor level for distributing the load. The work will be resumed as soon as final orders are received on the proposals.

II

Letter from the President, District Board, Madura, dated 6th October 1927, *R.O.C. No.* 272-*G. of* 1925.

I have the honour to submit herewith copy of the District Board Engineer's report as to the present condition of the District Board office building.

Letter from the District Board Engineer, Madura, to the President, District Board, Madura, dated 28th September 1927, *R.O.C. No.* 868 *of* 1927.

I have the honour to state that I examined the District Board office building on the 24th instant. The cracks which originally appeared at the beginning of November 1926 have not since developed in the least. The cement tell-tale pats fixed at intervals of 1 foot along the line of the cracks are all quite in-tact. The total depth of rainfall from November 1926 to September 1927 (up to the date of my inspection) comes to 21·08 inches. The rainfall was heavy on the following dates, as noted below :—

22nd June 1927	4·15 inches.
1st August 1927	2·42 ,,
10th September 1927	1·18 ,,
21st September 1927	1·60 ,,

The foundations of the present office building which has got a first floor, have been carried only to a depth of $4\frac{1}{2}$ feet below ground level and the building has been standing well for the last 40 years. The sub-soil in the foundations is not of a treacherous nature. In the western portion, kankar has been met with at 8 to 9 feet depth and in the eastern portion, compact sand has been met with at a depth of 10 feet and kankar at about 14 feet. In 4 out of 6 places the cracks do not extend at all in the concrete. It is only in two places, fine hair cracks can be traced in the concrete. As I have already submitted, the cracks are due partly to the hydraulic pressure of the water on the masonry during the exceptionally heavy rains, when the mortar in the masonry had not properly set, and partly to the natural consolidation of the sand filling under the concrete. The fact that there has been no further development in the cracks during the subsequent heavy rains shows that the sand in the foundations has thoroughly consolidated.

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A copy of my report R.O.C. No. 868/27, dated 22nd June 1927, sent to the Superintending Engineer, Trichinopoly Circle, submitting proposals for further procedure is herewith submitted. The work will be resumed as soon as final orders are received on the proposals.

Letter from the District Board Engineer, Madura, to the Superintending Engineer, Public Works Department, Trichinopoly Circle, dated 22nd June 1927, *R.O.C. No.* 868 *of* 1927.

I have the honour to state that as per instructions received in person at Kodaikanal, I conducted the following test recommended by Messrs. Jackson and Barker in the District Board Office building under construction :--

(i) Cement tell-tale pats 6″ × 2″ × ½″ thick were put on the lines of the cracks at vertical intervals of 1 foot.

(ii) An earthen bund 5 feet wide was placed around the exterior of the veranda walls to the full height of the basement and well consolidated. After the bund was formed and consolidated there was also rainfall on 2 consecutive days, nearly ½ inch on each day which helped to further consolidate the bank.

(iii) Levels were taken at about 60 points on the top of basement.

(iv) The whole of the sand filling was flooded with water equal to 8 inches rainfall in 24 hours with a 4 inches centrifugal pump (45,180 gallons).

(v) The tell-tale pats were examined after 6 days and found to have no cracks. Levels were taken at all those 60 points. In almost all the cases, the difference does not exceed ·01, thus showing that there has been no appreciable settlement of any portion of the structure after the flooding.

All the cracks were minutely examined by Mr. Barker by digging up to the bottom of the concrete. It is only in two places the fine hair cracks continue to the base of the concrete and in all other places, the concrete is quite intact.

There has been practically no load on the foundation bed. As remarked by Mr. Barker, the cracks should be due to the unbalanced hydraulic pressure of the water which fell on the basement during the heavy rain of 8 inches in 48 hours brought to bear on the exterior walls, causing cracks in the weakest portion of the masonry in the cross walls.

As regards the cracked portions, the following arrangement is suggested in Mr. Barker's report for strengthening the same :--

To encase the concrete foundations and walls for a length of 5 feet on each side of the crack with expanded metal 1½ × ⅛″ × 7½ lb. per square yard, secured to the concrete and joints in the masonry with stout iron staples, the expanded metal to be plastered with cement mortar (1 : 2) 1 inch thick. The top course over the basement for a depth of 9 inches has now been removed leaving only the cutstone plinth which covers a width of 9 inches over the veranda retaining walls. The masonry in the foundation consists of 3 layers each 1 foot high.

As the joints are nearly vertical in 2 or 3 places, and as the depth of the existing masonry is only 5½ feet, I would suggest in lieu of the above proposal of Mr. Barker, the following arrangements :--

(i) The masonry on either side of the crack for a length of 3 feet to be demolished.

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(ii) Just over the concrete, a ferro-concrete slab 6 feet long and 1 inch thick to be laid to the full width of the concrete, reinforcement being of iron rails placed 9 inches apart.

(iii) The remaining courses to be rebuilt with suitable bond stones. The total cost of this work including the ferro-concrete slab over the concrete comes to Rs. 600. I solicit the favour of orders whether this alternative arrangement may be adopted.

Secondly, as the foundation for the eastern and western halves vary, it is highly essential that a ferro-concrete slab should be laid over the walls all through, so as to prevent any unequal settlement under the load. As the depth of the cutstone plinth is 9″, the proposed slab with its top at the floor level will have to be laid to a thickness of 9″. In this connection, two alternative arrangements are proposed in Mr. Barker's report—

(i) To lay a continuous ferro-concrete slab over all the walls with its top at the floor level.

(ii) To lay and thoroughly consolidate 1″ gauge brick jelly about 2″ thick over the area hachured in red lines in the plan and to form a continuous ferro-concrete slab in the middle portion and also to cover the verandah retaining wall and main walls, the floor slab being kept $1\frac{1}{2}$″ below the portion over the walls which should be ultimately finished with granolithic paving $1\frac{1}{2}$″ thick.

The first proposal costs Rs. 3,400 and the second one an additional sum of Rs. 6,000. Taking the cost of re-building the masonry in the cracked portions, the total cost of the first proposal will come to Rs. 4,000 and that of the second proposal Rs. 10,000. From the results of the tests conducted, it will be quite enough, as per the suggestions of Mr. Barker, to carry out the first proposal. But, having regard to the heavy structure that is proposed to be built, the unequal nature of the foundations and the proximity of the river close by, I am of humble opinion that the second alternative proposal may be carried out. I consider it would be worth spending this additional sum of Rs. 6,000 which will secure the building against all possible dangers due to the disturbance of the foundation bed during high floods.

TRUTH ALONE TRIUMPHS